

REMARKS

This application has been reviewed in light of the Office Action dated December 4, 2003. Claims 1-35 are pending in this application, with Claims 28-35 having been withdrawn. Claims 1, 16, and 22 have been amended to define still more clearly what Applicant regards as his invention, and minor non-substantive amendments have been made to Claims 8, 9, 14, and 21. At least the latter changes have not been made for purposes relating to patentability. Claims 1, 16, and 22 are the independent claims under consideration.

The Office Action states that the drawings are objected to because of the brackets shown in Figs. 13 and 14. Attached hereto are replacement sheets of Figs. 13 and 14, in which the brackets have been deleted. Entry of the replacement sheets into the record is respectfully requested, as is withdrawal of the objection to the drawings.

The Office Action states that Claims 1-8 and 22-25 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 5,973,444 (*Xu et al.*) in view of U.S. Patent 6,628,053 (*Den et al.*); that Claims 9, 10, 13-15, 26 and 27 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 5,847,495 (*Yamanobe et al.*) in view of *Xu et al.* and in further view of *Den et al.*; and that Claims 11, 12 and 16-21 are rejected under 35 U.S.C. §103(a) as being unpatentable over *Yamanobe et al.* in view of *Xu et al.* in view of *Den et al.* and further in view of U.S. Patent 5,066,883 (*Yoshioka et al.*). Applicant respectfully traverses the rejections and submits that independent Claims 1, 16

and 22, as well as the claims dependent therefrom, are patentable over the cited art for at least the following reasons.

Claims 1, 16 and 22 have been amended to recite that the electron-emitting device layer includes a metal-oxide semiconductor, wherein the metal-oxide is selected from the group consisting of titanium oxide, zirconium oxide, and niobium oxide.¹ For example, as amended, Claim 1 is directed to an electron-emitting device comprising fiber comprising carbon as a main ingredient, and a layer including a metal-oxide semiconductor. The metal-oxide is selected from the group consisting of titanium oxide, zirconium oxide, and niobium oxide. The fiber is disposed on the layer and partially contains Pd.

Amended Claim 16 is directed to an electron-emitting device comprising first and second electrodes disposed with a gap on a surface of a substrate, a plurality of fibers each comprising carbon as a main ingredient electrically connected with the first electrode, means for applying to the second electrode a voltage higher than a voltage applied to the first electrode, and a layer including a metal-oxide semiconductor. The layer is disposed between the first electrode and the plurality of fibers. Ends of the plurality of fibers are higher than a surface of the second electrode from the surface of the substrate,

¹ / Despite the changes made to the claims herein, Applicant does not concede the propriety of the Section 103(a) rejection. Indeed, Applicant still strongly believes that the claims as presented in the Amendment filed on August 28, 2003 are patentable over the art relied on by the Examiner, for the reasons set forth in the Remarks section of that Amendment.

and a layer including a metal-oxide semiconductor. The metal-oxide is selected from the group consisting of titanium oxide, zirconium oxide and niobium oxide.

Amended Claim 22 recites features that are similar in many respects to those of Claim 1, and also recites that the fiber includes a plurality of layered graphens.

As pointed out in the Amendment filed on August 28, 2003, Xu et al. relates to carbon fiber-based field emission devices. As understood by Applicant, Xu et al. discloses that carbon fiber emitters for field emission devices are catalytically grown onto a selected area of a device surface. An insulating layer, such as silica or alumina, is used as a catalyst support material (see column 7, lines 52-58). Further, according to Xu et al., fibers can contain portions of the catalyst; for example, a fiber may contain at least one transition metal or a compound or alloy thereof. Xu et al. also discloses that the transition metal may be Fe, Co, Ni, Cr, Mn, Mo, W, Re, Ru, Os, Rh, Ir, Pd, Pt, Zn, or Cu (see col. 9, lines 25-39).

The Office Action asserts that, “Xu et al. discloses an electron-emitting device including carbon fibers and a catalyst of palladium for growing the carbon fibers” and points to col. 9, line 65, to col. 10, line 25, in support thereof. However, the Office Action concedes that Xu et al. does not appear to specify the use of Ti as the component of the oxide semiconductor growth surface.

The Office Action cites Den et al. for teaching “the use of Ti as a beneficial

component under the catalyst of a carbon nanotubes growth site...[and that] the Ti conductor beneficially provides excellent heat resistance and durability” and points to col. 9, lines 30-50, in support thereof.

Applicant respectfully submits that neither Xu et al. nor Den et al., considered individually or in any permissible combination, would disclose or suggest to one of ordinary skill in the relevant art an electron-emitting device that includes, “a layer including a metal-oxide semiconductor, wherein the metal oxide thereof is selected from the group consisting of titanium oxide, zirconium oxide, and niobium oxide,” as recited in Claim 1.

Applicant submits that there is no motivation or suggestion in Xu et al. to replace titanium with titanium oxide, because titanium and titanium oxide are different substances with different properties. Moreover, it is well known that when a metal is changed to a compound such as an oxide, the compound exhibits chemical properties different than those of the metal alone.

Den et al. discloses that a conductive layer 21 preferably is comprised of a layer containing at least one element selected from the group consisting of titanium, zirconium, niobium, tantalum, molybdenum, copper, and zinc (see col. 9, lines 30-40). Further, Den et al. discloses that the conductive layer 21 is covered by an insulating layer 35, see Figs. 6A-6D and col. 8, lines 22-28). However, Den et al. does not teach or suggest that the insulating layer 35 includes a metal-oxide semiconductor (emphasis added).

Accordingly, because neither Xu et al. nor Den et al. are seen to disclose or

suggest the metal-oxide semiconductor feature of independent Claims 1 and 22, those claims are submitted to be patentable over the cited references.

Similarly, both Yamanobe et al. and Yoshioka et al. do not disclose or suggest a metal-oxide semiconductor such as that recited in Claim 16.


Accordingly, because neither Yamanobe et al. nor Yoshioka et al. are seen to disclose or suggest the metal-oxide semiconductor feature of independent Claim 16, that claim is submitted to be patentable over the cited references.

The other claims in this application are each dependent from one or another of the independent claims discussed above and are therefore believed patentable for the same reasons. Since each dependent claim is also deemed to define an additional aspect of the invention, however, the individual reconsideration of the patentability of each on its own merits is respectfully requested.

This Amendment After Final Action is believed clearly to place this application in condition for allowance and, therefore, its entry is believed proper under 37 C.F.R. § 1.116. Accordingly, entry of this Amendment, as an earnest effort to advance prosecution and reduce the number of issues, is respectfully requested. Should the Examiner believe that issues remain outstanding, it is respectfully requested that the Examiner contact Applicants' undersigned attorney in an effort to resolve such issues and advance the case to issue.

Applicant's undersigned attorney may be reached in our New York office by telephone at (212) 218-2100 or by facsimile at (212) 218-2200. All correspondence should continue to be directed to our address given below.

Respectfully submitted,


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